

CIF 22-10: Plasma Rapid Oxidation Technique for Extending Component Tenability (PROTECT)

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Activity Type: New Start

Primary STMD Taxonomy: TX13.2.8 Environment Testing

Start TRL: 2

End TRL: 3

Executive Summary: Additive manufacturing (AM) is increasingly utilized in aerospace applications. However, post-processing is required for many applications, so intricate designs are limited. Plasma electrolytic oxidation (PEO) was investigated as a post-processing treatment on Ti-6-4 (or Ti-6Al-4V: Alpha-beta titanium alloy with a high specific strength and excellent corrosion resistance) additively manufactured specimens. The “Keronite Black” PEO treatment reduced the surface roughness (Ra) of test specimens by approximately 0.5 μm . This reduction in Ra compared to the as-printed sample was hypothesized to benefit corrosion and fatigue properties because increased Ra is known to negatively impact corrosion and fatigue characteristics. Up to a 101% improvement in the corrosion potential (E_{corr}) was observed. Although fatigue characteristics varied by PEO parameters, there was no significant fatigue debit due to the PEO treatment. Additionally, no effect to adhesion characteristics was observed due to PEO treatment. It is recommended that additional studies investigate the ability of PEO treatments to improve the corrosion, fatigue, chemical compatibility, radiation hardening, particle shedding characteristics, and flammability/oxidizer compatibility of aerospace additively manufactured components.